REMARKS

Favorable reconsideration of this application in view of the above amendments and the following remarks is respectfully requested. Currently, claims 1, 3-29, 31-43, 45-50, 52-62, 64-70, 72-78, and 80-102 are pending, of which claims 1, 28, 49, 64, 72, 76, and 102 are independent. By the above amendments, claims 2, 30, 44, 51, 63, 71, and 79 have been canceled, and claims 1, 3, 5, 7, 8, 14, 28, 31, 39, 49, 52, 60, 64, 72, 76, 80, 88, 97, and 102 have been amended.

Applicant notes that the Examiner has commented that claims 1-102 may not all be directed to the same subject matter as required under 37 CFR 1.141, and that a restriction requirement may be necessary. Applicant submits that all of the claims can be examined in a single application, as will be appreciated from the remarks below. However, if the Examiner believes that a restriction is necessary, Applicant will address such requirement when presented.

Summary of the Invention and Claims

Generally, the subject matter of the instant application relates to a system for estimating the position of an emitter by detecting a signal from the emitter at receivers located at different locations and computing the emitter's position based on the receivers' position and the timing of the arrival of the signal at the different receivers. Conventional position-determining systems typically include a set of fixed-position receivers having local clocks that are time-synchronized. When a signal of interest is detected by the receivers, the position of the emitter can be determined via trilateration based on the known, fixed positions of the receivers and the timing of reception of the signal at the receivers as measured by the synchronized receiver clocks.

Unlike conventional position-determining systems, the receivers of the system described in the instant application can be mobile communication devices and can use cost effective, low accuracy clocks, which need not be time synchronized. These features permit the system to be deployed economically in scenarios where conventional position-determining systems are not practical or even feasible, such as in fire and rescue operations or other situations with dynamically changing communications topologies.

To accurately determine the position of an emitter, the positions of the mobile receivers must be known at the time of detection. These positions can be determined, for example, from round-trip signal propagation delays of messages exchanged with other devices, as described in Applicant's specification. Likewise, timing differences between the local clocks of the receivers must be accounted for to accurately compute the position of the emitter. These timing differences can be computed using a round-trip signal propagation time determined from exchanging time synchronization signals between the receivers and a reference communication device (which can be one of the receivers). This scheme differs from convention, time-synchronized systems which typically employ a one-way transmission (e.g., a sync signal) to maintain synchronization.

The application currently includes seven independent claims: independent claim 1 relates to a method of determining the position of an emitter; independent claims 76 and 102 are somewhat analogous to claim 1 and recite a system for determining the position of an emitter; independent claims 28 and 49 relate to a receiver device that receives the emitter signal; and independent claims 64 and 72 relate to a reference communication device that provides a common time reference frame to the receiver devices (claims 102 , 28, and 64 employ means-plus-function language). Although the specific wording varies from claim to claims, all of the independent claims have been amended to essentially require that timing differences between the local time reference frames of the receiver devices and a common timing reference frame are determined based on a round-trip signal propagation time determined from exchanging time synchronization signals between the receiver devices and a reference communication device. Further, independent claims 1, 28, 49, 76, and 102 have been amended to require that at least one of the receiver devices is mobile, while independent claims 64 and 72 have been amended to require that the reference communication device is mobile.

Rejections of the Claims

Claims 1-102 stand rejected under 35 USC 102(a) as being anticipated by GB 2 353 671 to Hulbert et al. Further, claims 1, 9-27, and 102 stand rejected under 35 USC 102(e) as anticipated by U.S. Publication No. 2001/0030625 to Doles et al. Finally, claims 2-8 and 28-101

stand rejected under 35 USC 103(a) as unpatentable over Doles in view of EP 1 073 216 to McKay et al. These rejections are respectfully traversed insofar as they apply to the amended claims.

As noted above, all of the independent claims essentially require determine a timing difference between a local time reference frame of a receiver and a common time reference frame of a reference communication device based on a round-trip signal propagation time determined from exchanging time synchronization signals between the receiver and the reference communication device. Further, independent claims 1, 28, 49, 76, and 102 require at least one receiver to be mobile, and independent claims 64 and 72 require the reference communication device to be mobile. None of these claim requirements is disclosed or suggested by any of the references, taken singly or in any combination.

Hulbert describes a method of providing synchronization between a plurality of base stations in a telecommunication system that includes a plurality of cells. Each cell includes one of the base stations and at least one mobile station. Also, Hulbert describes a method of locating a mobile station within a telecommunication cell of the system involving determining the location of three base stations, scheduling synchronization measurements for each of the base stations using RACH, comparing a signal received from the mobile on the RACH with timing signals in each base station and using the comparison to determine the mobile location. Hulbert provides a cellular orientated-type system, where the cellular system is equipped with GPS and requires synchronization among the base stations. In particular, Hulbert involves a fixed, connected base stations. Specifically, three (or more) synchronized base stations in Hulbert receive the signal from the mobile station and compare the reception time with their own timing. The positions of the base stations are known. By knowing the positions of the synchronized base stations, the mobile station can be located.

In contrast to Applicant's claims 1, 28, 49, 76, and 102, which require at least one of the receivers to be mobile, all of Hulbert's base stations are at fixed (stationary) locations. Further, unlike claims 64 and 72, which require a mobile reference communication device, there is no disclosure or suggestion in Hulbert of a mobile reference communication device that provides a common time reference frame to Hulbert's base stations. Moreover, while Hulbert discloses transmission of synchronize signals, there is no suggestion whatsoever in Hulbert to determine a

timing difference between a local time reference frame of a receiver and a common time reference frame of a reference communication device based on a round-trip signal propagation time determined from exchanging time synchronization signals between the receiver and the reference communication device, as required by all of Applicant's claims. Like typical synchronization schemes, Hulbert transmits one-way synchronization signals. Thus, claims 1-102 are not anticipated by Hulbert; accordingly, the Examiner is respectfully requested to reconsider and withdraw the rejection of claims 1-102 over Hulbert.

Doles relates to an object tracking system for identifying locations of radio-tagged objects that includes using TOA measurements from a fixed position reference tag to update a reader clock offset database for maintaining the reader clocks in mutual synchronization. At paragraph 22, Doles describes a synchronization problem from which its system suffers. In particular, there is a constant time drift that is constantly corrected by fixed offsets and then by a bulk correction. At paragraphs 28 and 29, Doles describes how local TOA measurements are taken for a tag emission and how local clocks are kept in "mutual synchronization that ensure accurate differential time of arrival based location measurements [using] a reader clock calibration database, which contains a table of periodically recalibrated reader clock offsets that correct for drifts in the various reader clocks." The reader clocks offsets are updated by processing time-of-arrival measurements performed by the tag readers on periodic calibration transmissions from a reference tag.

McKay describes a method for synchronizing base stations that were previously unsynchronized when determining the geographical position of a mobile. McKay synchronizes the clock of the remote base station with the clock of the serving base station. Thus, McKay describes a synchronized system.

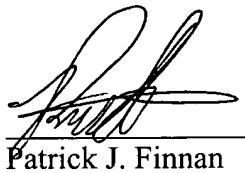
Like Hulbert, both Doles and McKay fail to disclose or suggest a mobile receiver in an emitter location system, as required by claims 1, 28, 49, 76, and 102, or a mobile reference communication device that provides a common time reference frame to receivers as require by claims 64 and 72. Moreover, both Doles and McKay fail to disclose or suggest determining a timing difference between a local time reference frame of a receiver and a common time reference frame of a reference communication device based on a round-trip signal propagation time determined from exchanging time synchronization signals between the receiver and the

reference communication device, as required by all of Applicant's claims. Consequently, Doles does not anticipate any of claims 1-102, and the subject matter of these claims would not have been (and could not have bee) obvious from any combination of Doles and McKay. Accordingly, the Examiner is respectfully requested to reconsider and withdraw the rejections of the claims over Doles and McKay.

In view of the foregoing, Applicant respectfully requests the Examiner to find the application to be in condition for allowance with claims 1, 3-29, 31-43, 45-50, 52-62, 64-70, 72-78, and 80-102. However, if for any reason the Examiner feels that the application is not now in condition for allowance, the Examiner is respectfully requested to call the undersigned attorney to discuss any unresolved issues and to expedite the disposition of the application.

Applicant hereby petitions for any extension of time which may be required to maintain the pendency of this case, and any required fee for such extension is to be charged to Deposit Account No. 05-0460.

Respectfully submitted,



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